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CORROSION OF METALS BY CRACKING GASOLINES AND OTHER UNSATURATED FUELS

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/A Digest/

Evaluation of the experimental material on the subject presents some interest because corrosion of metal by fuels remains a practical problem. The corrosive effect of cracking gasoline is brought about by auto-oxidation. The high content of unsaturated hydrocarbons, particularly of dienes, in cracking gasoline leads to great reactivity towards the oxygen of the air, so that peroxides, aldehydes, acids, and other products are formed.

The oxidation products which are especially effective in causing corrosion are naturally, acids. Starting with neutral, i.e., acid-free, Baku cracking gasoline, it could be shown that as the corrosion of zinc in contact with the gasoline proceeded, both the acidity and the content of resin-forming substances increased. The amount of corrosion caused by cracking gasolines is a function of the effective concentration of resin-forming substances. The curves depicting the dependence of corrosion on the effective content of resin-forming substances and those representing corrosion as a function of acid content resemble each other closely.

Resin-forming substances arise from acids and their derivatives, peroxides, aldehydes, and other products of auto-oxidation, the acids and peroxides being the most important components. The views of G. H. Denison, Jr, and C. F. Prutton (Ind. Eng. Chem., Vol XXXVI, 477, 1944; ibid, XXXVII, 90, 1945) on the predominant effect of peroxides in corrosion are probably incorrect; carboxylic acids must be assumed to play a much more important role in the process.

The low peroxide content of cracking gasolines in experiments with copper and iron, and the relatively high content of peroxides in corresponding experiments with zinc, magnesium, and lead, reflect the characteristic course of gasoline auto-oxidation in the presence of metals. Low concentrations of peroxides

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are caused by decomposition of the latter under the influence of dissolved corrosion products acting as catalysts. In the corrosion of lead, zinc, and magnesium, the formation of carbonates takes place; up to 60 percent of corroded lead were found to be combined with carbon dioxide. Apparently carbon dioxide regenerates acids which again react with the metal, and thus increase corrosion.

Local corrosive action is produced by resins which are deposited unevenly on the metal.

The reverse correlation between the iodine number and the degree of corrosion is understandable: as oxidation proceeds, the degree of unsaturation decreases.

The best means of preventing corrosion caused by cracking gasoline is the addition of suitable inhibitors before oxidation starts (L. G. Gindin and R. S. Abramtsumyan, Zhurnal Fiz. Khim., No 2, 222, 1937).

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